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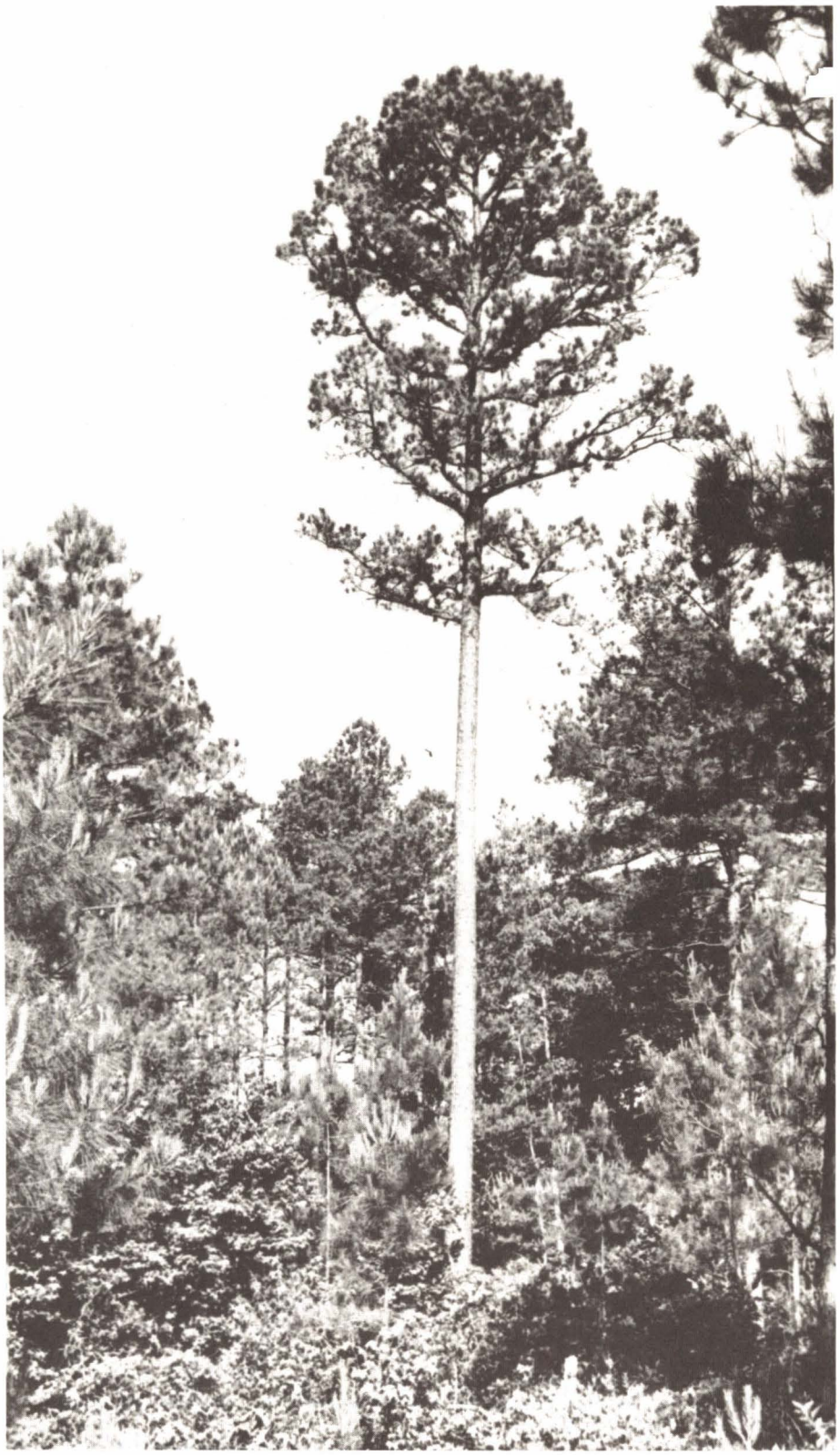
The Southern Pines

An American Wood

The four major southern pines are principal sources of softwood products in the United States. Their individual ranges overlap and extend from the upper areas of the South Atlantic States across the Southern States to Texas and Oklahoma. Wood of the various pines is similar in appearance and difficult to separate into species. It is strong, dries rapidly, treats easily with chemicals, and works moderately hard with tools. The wood is widely used for residential construction and pulp and paper products, as well as for large items such as utility poles, piling, and railway ties when treated with preservatives. Six minor pines are often found mixed in with the major species.



The Southern Pines

Loblolly pine (*Pinus taeda* L.)
Longleaf pine (*Pinus palustris* Mill.)
Shortleaf pine (*Pinus echinata* Mill.)
Slash pine (*Pinus elliottii* Engelm.)

Louis I. Gaby[1]

Distribution

Loblolly pine grows on the Coastal Plain and Piedmont from southern New Jersey to eastern Texas and as far south as central Florida (fig. 1). Its wide range, occurrence in pure stands, and general utility make it the most commercially important southern pine species. This species grows on a wide variety of soils, but it grows best on soils that have poor to moderate surface drainage, a deep surface layer, and a firm subsoil. Loblolly pine grows at all elevations up to 2,000 feet. Where it does not grow in pure stands, loblolly pine is found in mixtures with shortleaf pine and many hardwoods and competes with other trees to about the same degree as shortleaf pine.

Longleaf pine grows naturally in a belt 150 miles wide extending from the southeastern part of Virginia to central Florida and west into southeastern Texas at elevations ranging from sea level to 600 feet (fig. 2). It is not competitive with other trees and grows best in pure stands on well-drained acid soils that are low in organic matter. Longleaf pine also occurs in the sandhills, flatlands, and some imperfectly drained sites on the lower Coastal Plain. On sandy sites it is usually found in association with scrub oaks; on more moist sites it occurs in mixtures with slash pine, loblolly pine, and hardwoods.

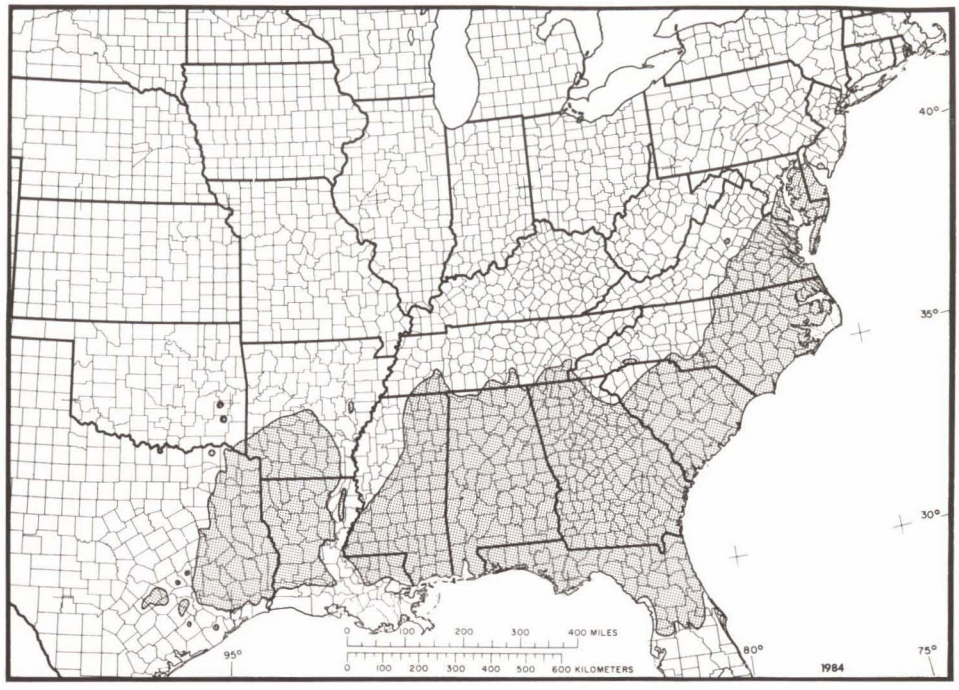


Figure 1—Natural range of loblolly pine.

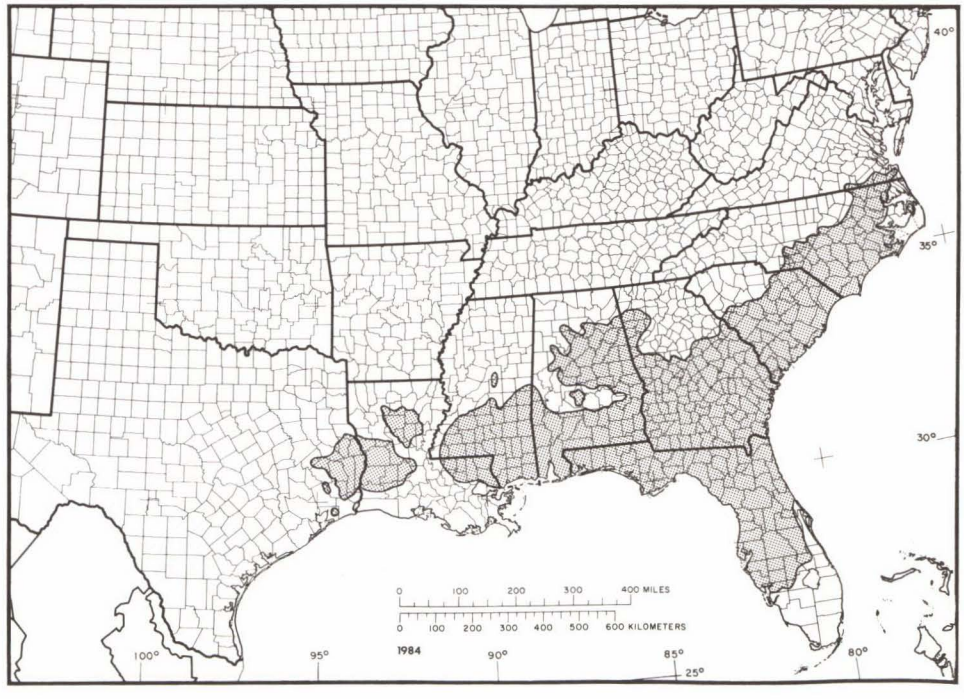


Figure 2—Natural range of longleaf pine.

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Shortleaf pine, with the widest range of any southern pine, grows from southeastern New York into portions of the Central States, west to Oklahoma and Texas, and as far south as northern Florida (fig. 3). In the northern portions of its range it grows at elevations as low as 10 feet; in the southern areas it occurs at all elevations up to 3,300 feet. It grows on a wide variety of soils, but thrives best on fine sandy loam or silt that has good drainage. It prefers acid soils and can grow on drier sites than loblolly pine. Shortleaf pine is not competitive with other trees, but it will grow in dense pure stands and in mixtures with various hardwoods and other pines.

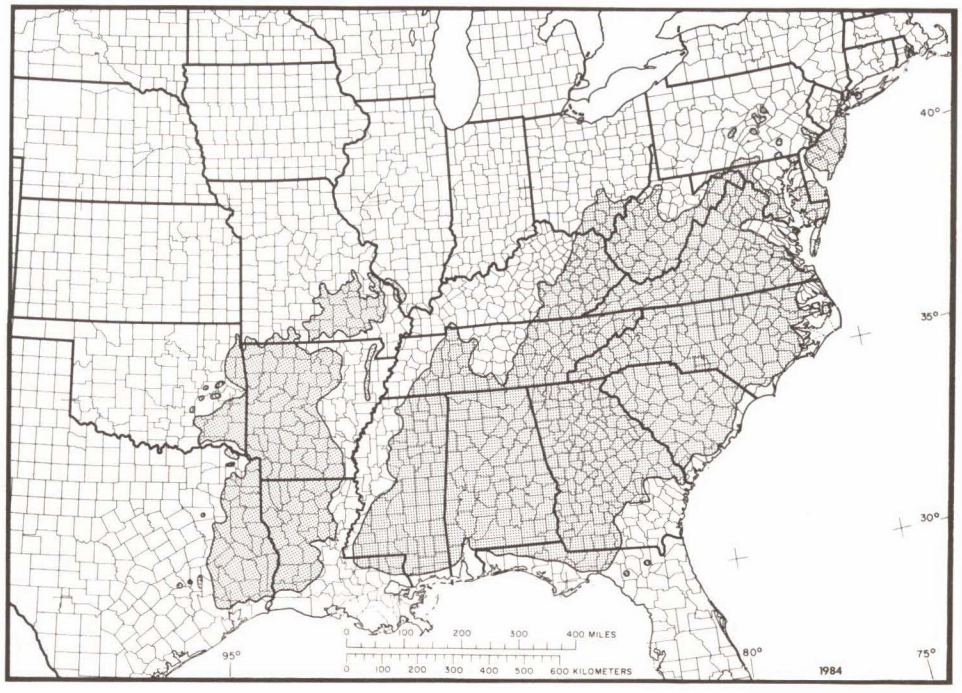

Figure 3—Natural range of shortleaf pine.

The range of **slash pine** extends on the Coastal Plain from central South Carolina to central Florida and west to Louisiana (fig. 4). Plantations exist in east Texas and in parts of the Piedmont Plateau. Natural stands of slash pine are usually on sandy soils that are underlain by a shallow, poorly drained hardpan and in narrow bands along minor drainages. Topography does not vary much in the natural range of slash pine, but changes of 1 to 2 feet in elevation influence productivity of this species. Slash pine is more competitive than longleaf pine, but less so than loblolly pine, and is associated with longleaf pine, loblolly pine, gum, oaks, and other hardwoods.

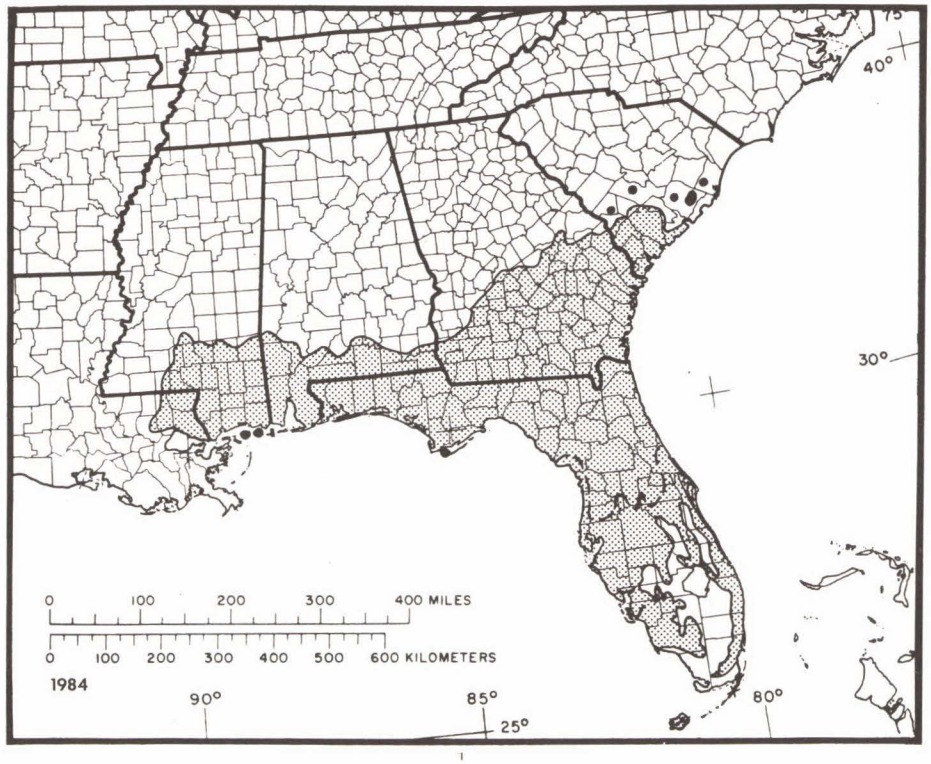

Figure 4—Natural range of slash pine.

Description and Growth

Typical leaves, cones, and flowers of the four major species are shown in figures 6, 7, 8, and 9. Typical barks are shown in figures 10, 11, 12, and 13. The table details the differences in cones, seeds, needles, and bark among the major southern pines.

Loblolly pine grows faster than either longleaf or shortleaf pine through the sapling stage. It is aggressive and expresses dominance early. Stem and branch cankers caused by fusiform rust are often present, particularly in plantations. A mature, high-quality loblolly

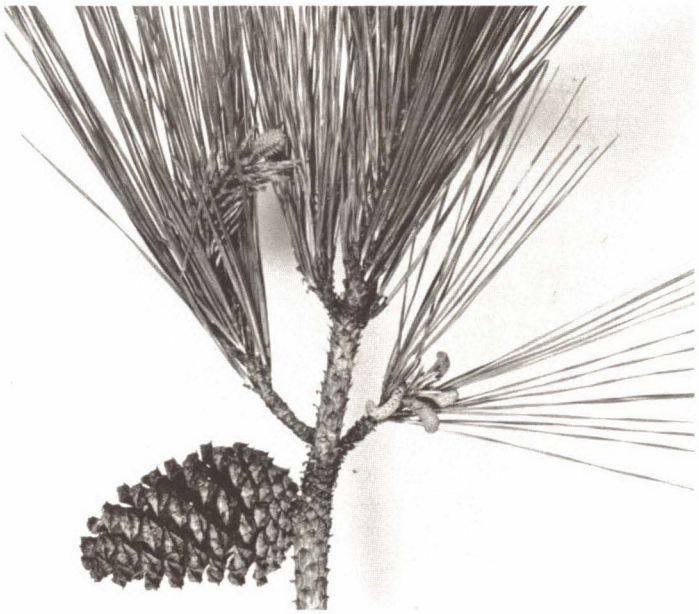

Figure 5—Leaves, cone, and flowers of loblolly pine.

Figure 7—Leaves, cones, and flowers of shortleaf pine.

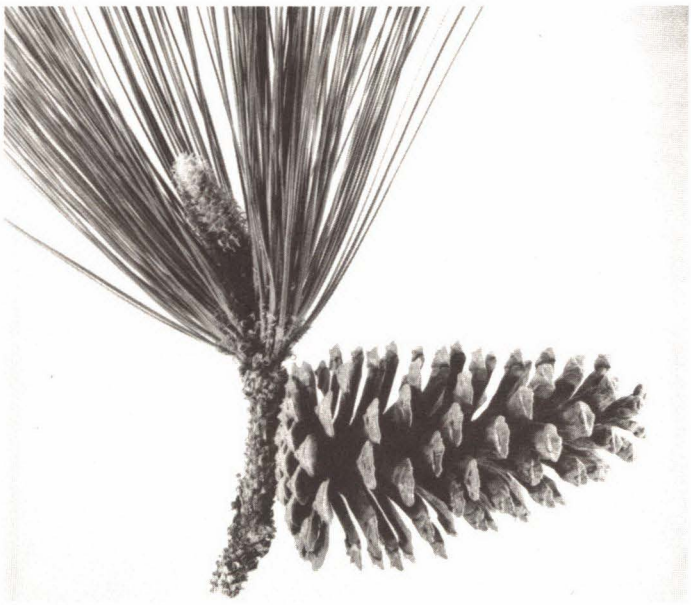

Figure 6—Leaves, cone, and flowers of longleaf pine.

Figure 8—Leaves, cone, and flowers of slash pine.

pine, 24 inches in diameter, is shown on the cover of this leaflet.

Longleaf pine seedlings normally have a comparatively slow growth rate during the first 3 to 7 years, and longer if growing conditions are poor. During this period, seedlings and saplings may be extensively damaged by piney woods hogs, which eat the starchy bark of the roots. Brown spot needle blight is a major cause of mortality in seedlings and young saplings. A mature longleaf pine is shown in figure 13.

Shortleaf pine is a moderately fast-growing tree. If the upper stems of seedlings are damaged by fire, buds develop near the groundline and sprout readily. The most serious disease of shortleaf pine is littleleaf disease, which is caused primarily by a parasitic root

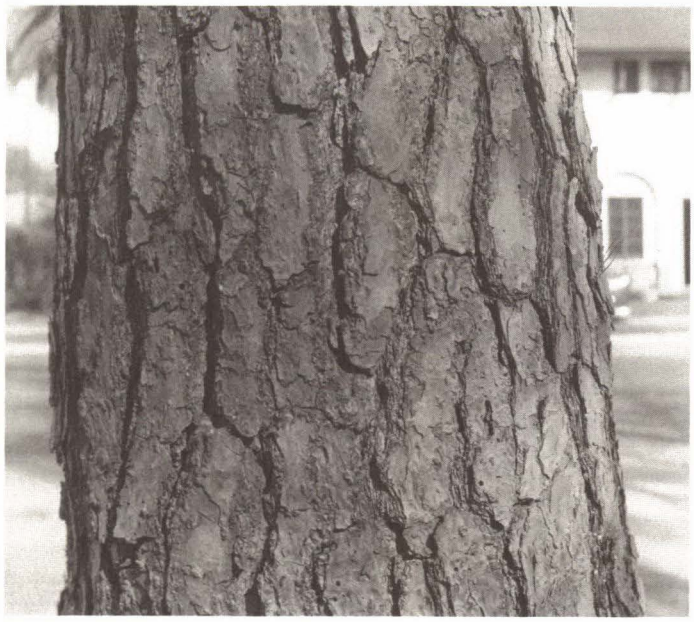

Figure 9—Bark of mature loblolly pine.

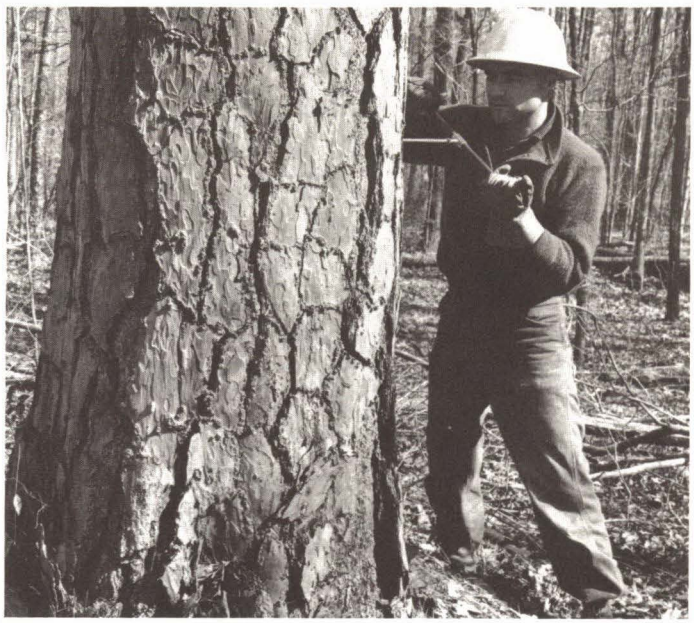

Figure 11—Bark of mature shortleaf pine.

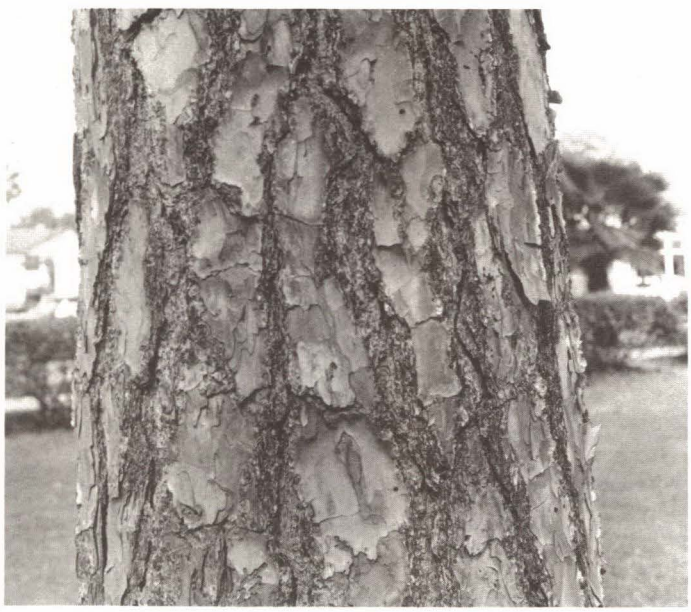

Figure 10—Bark of mature longleaf pine.

Figure 12—Bark of mature slash pine.

fungus in combination with soil factors such as poor aeration, low fertility, and periodic moisture stress. Littleleaf is a major obstacle to the management of this species over extensive areas. No practical control measures have been found for forest stands. An old shortleaf pine is shown in figure 14.

Roots and tops of slash pine seedlings grow rapidly, giving the species an early advantage over competing vegetation. In fact, a 1-year age difference in seedlings will bring about permanent suppression of the younger stock. Young seedlings are easily damaged or killed by fire. Fusiform rust often causes high mortality in plantations. A mature slash pine, 70 feet high and 24 inches in diameter, is shown in figure 15.

Figure 13—A mature longleaf pine.

Figure 14—A mature shortleaf pine.

Figure 15—A mature slash pine.

Differences in the cones, seeds, needles, and bark of mature southern pine trees.

Species	Cones	Seeds	Needles	Bark
Loblolly	2 to 6 in. long, yellowish brown, sessile, cone scale tips depressed	1/4 in. long, dark brown, roughed with black markings	In fascicles of 3, 6 to 9 in. long	Reddish-brown scaly plates
Longleaf	6 to 10 in. long, dull reddish brown	1/2 in. long, slightly ridged, pale with dark blotches	In fascicles of 3, 8 to 18 in. long	Coarsely scaly
Shortleaf	1-1/2 to 2-1/2 in. long, light reddish brown	3/16 in. long, brown with black markings	In fascicles of 2 and 3, 3 to 5 in. long	Reddish-brown, broken, irregular, flat plates
Slash	2 to 6 in. long, reddish brown, short-stalked, cone scale tips full and rounded	1/4 in. long, somewhat triangular, black, ridged	In fascicles of 2 and 3, 8 to 12 in. long	Plated and thick with thin papery scales

Common Names

Southern pine is the name common to all four major species. The botanical name, principal common name, and other local or trade names are as follows:

Common name	*Botanical name*	*Other names*
Longleaf pine	*Pinus palustris* Mill.	Hard pine, heart pine, longleaf yellow pine, longstraw pine
Slash pine	*Pinus elliottii* Engelm.	Pitch pine, swamp pine, yellow slash pine
Shortleaf pine	*Pinus echinata* Mill.	Shortleaf yellow pine, yellow pine
Loblolly pine	*Pinus taeda* L.	Arkansas pine, North Carolina pine, oldfield pine, shortleaf pine

Related Commercial Species

Minor species of southern pine—pitch pine (*Pinus rigida*), pond pine (*P. serotina*), sand pine (*P. clausa*), spruce pine (*P. glabra*), Table Mountain pine (*P. pungens*), and Virginia pine (*P. virginiana*)—occur throughout the ranges of the major southern pine species and further north. They generally grow in mixed stands and are usually harvested along with the major pines. The supply and production figures in this leaflet are for both major and minor species. The minor pines cross naturally with nearly all of the major pines to produce hybrids, such as pond-loblolly and pitch-shortleaf. Crosses between major pines have also been observed and artificially produced.

Supply

The original southern pine forests contained an estimated 650,000 million board feet. Net volume of standing sawtimber in 1977 was approximately 314,000 million board feet. About 90 percent of the current volume is in the coastal Southern States plus Arkansas and Oklahoma. The southern pines provide one-third of the Nation's net sawtimber growth.

As of 1980, about 1.4 million acres per year had been planted or artificially seeded with southern pines. This emphasis on planting combined with the abandonment of agricultural land, timber stand improvement, improved fire protection, and the increasing number of integrated wood-using industries has helped make southern pine one of the major crops in many Southern States.

Production

Approximately 37 percent of all softwood sawtimber cut in the United States is southern pine. These pines are used for pulpwood, poles, piling, fuelwood, railway ties, plywood, excelsior, and naval stores products.

From 1869 to 1909, southern pine lumber production rose steadily from 1,378 million board feet to a peak of 16,277 million board feet. After that, production declined gradually at first and then rapidly after the onset of the Great Depression. In 1932, production reached its low point of 3,089 million board feet. From 1952 to 1976, the annual cut of southern pine lumber ranged from 6,000 to 8,000 million board feet.

Southern pine pulpwood production has increased in almost every year since the early 1930's. In 1980, the output reached a high of 54.5 million cords. Pulpmills using southern pine consumed 63 percent of the Nation's domestic roundwood pulpwood production in 1979.

Research and development work at the Forest Service's Forest Products Laboratory and by industry accelerated the establishment of a vigorous southern pine plywood industry in 1963. Three plants were in production in 1964. By 1972, the number of operating plants increased to 57, with an additional 6 planned or under construction. Production rose from 80 million square feet (3/8-inch basis) in 1964 to 6.8 billion square feet in 1976 and is expected to reach 13.1 billion square feet annually in the year 2030.

Characteristics and Properties

The woods of the various southern pines are similar in appearance. Although the standing trees are usually easy to distinguish, pieces of wood are impossible to separate into species. In general, the sapwood is yellowish white and the heartwood reddish brown. The sapwood contains less resin than the heartwood, but resin exudes more readily from the sapwood. The transition from sapwood to heartwood is generally evident, and the change in growth ring bands from light earlywood to dark latewood bands is distinct.

Slash and longleaf pines are classed as very heavy and strong, with slash pines slightly higher in both properties. Both of these species are classed as very stiff, hard, and moderately high in shock resistance. Shortleaf and loblolly pine are lower in weight and strength properties than slash and longleaf pine. The average weights per cubic foot of the four principal southern pines, conditioned to 12-percent moisture content, are: slash and longleaf, 41 pounds; shortleaf and loblolly, 36 pounds. Their average specific gravities, based on volume when green and weight when ovendry are: slash and longleaf, 0.54; shortleaf and loblolly, 0.47.

The heartwood of the southern pines is considered moderate to low in resistance to decay, yet equal in this respect to other commonly used softwood construction species. The sapwood, like most other widely used construction species, is low in resistance to decay, but is more easily impregnated with chemical wood preservatives than most softwoods.

Their long, strong fibers make southern pines the principal species for kraft board and paper produced by the sulfate pulping process. Less resinous, light-colored, young longleaf and slash pines, as well as shortleaf and loblolly pines, are suited to the production of bleached newsprint. All four species have equally long fibers (4.0 millimeters average) and high yields of chemical pulp (48 percent, based on ovendry weight in the sulfate process).

When dried from green to 6-percent moisture content, southern pine wood shrinks from 3.5 to 4.4 percent radially and from 5.9 to 6.2 percent tangentially to the annual rings. Normal longitudinal shrinkage under the same drying conditions is from 0.02 to 0.52 percent, but the longitudinal shrinkage of compression wood is as much as 10 times this amount, with correspondingly greater warping.

Freshly cut heartwood has approximately 32-percent moisture content, based on its ovendry weight, whereas the green sapwood moisture content averages about 110 percent. Southern pine lumber dries rapidly under favorable air-drying conditions. Boards 1 inch thick can be kiln dried in 3 days or less. Prolonged poor drying weather or improper stacking during air drying will usually bring about discoloration known as blue stain. Blue stain can be avoided by chemical dips and proper stacking for drying.

Southern pines are typically straight grained, medium in texture, and relatively difficult to work with hand tools. They rank high in nail-holding capacity. Techniques have been developed for making acceptable glue bonds commercially. Sapwood is easy to impregnate with wood preservatives, and pressure treatment extends durability and usefulness tenfold.

Principal Uses

The southern pines have an unusual combination of wood properties that permits their use in a wide range of products. Dense southern pine is preferred in heavy construction, such as bridges, trestles, and dock works. Shortleaf and loblolly pines are used for construction where strength is not as important. Southern pine lumber shares with Douglas-fir the major market for laminated softwood timbers.

Southern pines are the chief species used for wood pulp nationally. Roundwood and chips are used in the sulfate and semichemical processes, mainly to produce kraft paper and newsprint.

A large amount of southern pine is used to produce plywood; this industry began in 1963. Most of the plywood goes into residential sheathing and general construction.

Utility poles, piling, and railway ties in significant volumes are produced from southern pine, and some mine timbers are also made. For these uses, the pieces are given a preservative treatment under pressure.

The Nation's rosin and turpentine, generally referred to as naval stores, come from slash and longleaf pines. These products can be derived by any one of three processes: collecting the exudate from living trees as a crop, steam distilling of resinous stumps, or as byproducts of the sulfate pulping process. Approximately 60 percent of the rosin and 85 percent of the turpentine currently produced in the United States result from the pulping process.

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